SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-41

Name: Lake Campbell **County**: Brookings
Legal Description: T109N- R50W- Sec. 28, 29, 32, 33; T108N- R50W-Sec. 5
Location from nearest town: 6 miles south and 2 miles west of Brookings, SD

Dates of present survey: July 1-2, 2008
Dates of last survey: June 28-30, 2006

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	White Bass
	Bluegill
	Channel Catfish
	White Sucker
	Common Carp
	Bigmouth Buffalo
	Black Crappie
	Black Bullhead
	Shorthead Redhorse

PHYSICAL DATA

Surface area: 1,000 acres
Maximum depth: 7 feet
Volume: 4,000 acre feet
Contour map available: Yes
OHWM elevation: 1575.7
Outlet elevation: 1575.2
Watershed area: 103,762 acres
Mean depth: 4 feet
Shoreline length: 7.2 miles
Date mapped: 1996
Date set: April, 1983
Date set: April, 1983
Lake elevation observed during the survey: Full
Beneficial use classifications: (6) warmwater marginal fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Introduction

Lake Campbell was named after Albert H. Campbell of the Pacific Wagon Railroad. The lake lies on the downstream end of the Badus-Battle Creek drainage which flows into the Big Sioux River. The watershed is mostly cropland which contributes a heavy silt load to the lake whenever runoff occurs. As a result, Lake Campbell is very shallow, water quality is poor, and fish kills are frequent.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Campbell is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). GFP also owns and manages an access area on the north end of the lake. There is a road right-of-way on the south end of the lake owned by Moody County and open for public access. The remainder of the shoreline is privately owned.

Fishing Access

The North Shore Access Area contains a new concrete plank boat ramp, boat dock, a vault toilet, and a handicapped-accessible fishing pier. There are several areas suitable for shore fishing on this area as well. Shore fishing also occurs off the bridge and shoreline on the south end of the lake.

Field Observations of Water Quality and Aquatic Vegetation:

The water in Lake Campbell was very turbid during the survey with Secchi depth measurement of 25.4 cm (10 in). A few scattered beds of sago pondweed (*Potamogeton pectinatus*) were observed in shallow areas.

BIOLOGICAL DATA

Methods

Lake Campbell was sampled on July 1-2, 2008 with three overnight gill net sets and ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Gill net and trap net sites are displayed in Figure 3.

Results and Discussion

Gill Net Catch

Black bullheads (38.4%) were the most abundant species sampled in the gill nets (Table 1). Other species caught included white sucker, common carp, walleye, yellow perch, northern pike, orange-spotted sunfish, common shiner, emerald shiner, and yellow bullhead.

Table 1. Total catch from three overnight gill net sets at Lake Campbell, Brookings County, July 1-2, 2008.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE *[*]	PSD	RSD-P	Mean Wr
Black Bullhead	109	38.4	36.3	±1.1	47.5	33	0	104
White Sucker	49	17.3	16.3	±3.1	12.0	78	43	97
Common Carp	49	17.3	16.3	±4.2	6.8	18	6	99
Walleye	45	15.8	15.0	±5.6	9.2	47	7	99
Yellow Perch	16	5.6	5.3	±1.9	29.5	56	44	106
Northern Pike	6	2.1	2.0	±0.7	3.8	--	--	--
O. S. Sunfish	4	1.4	1.3	±1.7	0.1	--	--	--
Common Shiner	3	1.1	1.0	±0.7	0.4	--	--	--
Emerald Shiner	2	0.7	0.7	±0.4	1.3	--	--	--
Yellow Bullhead	1	0.4	0.3	±0.4	0.0	--	--	--

* 7 years (1994, 1996, 1998, 2000, 2002, 2004, 2006)

Trap Net Catch

Black bullheads made up 72.9% of the trap net catch (Table 2). Other species sampled included orange-spotted sunfish, common carp, white sucker, bigmouth buffalo, northern pike, yellow perch, yellow bullhead, walleye, green sunfish, and channel catfish.

Table 2. Total catch from ten overnight trap net sets at Lake Campbell, Brookings County, July 1-2, 2008, 2008.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE *	PSD	RSD-P	Mean Wr
Black Bullhead	1,534	72.9	153.4	±47.9	770.9	39	0	101
O. S. Sunfish	256	12.2	25.6	±17.0	0.0	--	--	--
Common Carp	171	8.1	17.1	±7.8	4.8	16	2	100
White Sucker	41	1.9	4.1	±1.6	2.3	80	34	94
Bigmouth Buffalo	30	1.4	3.0	±1.8	8.2	87	30	93
Northern Pike	27	1.3	2.7	±0.9	3.3	88	27	95
Yellow Perch	18	0.9	1.8	±1.4	1.9	22	22	101
Yellow Bullhead	13	0.6	1.3	±0.6	0.8	92	62	116
Walleye	9	0.4	0.9	±0.4	1.8	--	--	--
Green Sunfish	4	0.2	0.4	±0.3	0.1	--	--	--
Channel Catfish	2	0.1	0.2	±0.2	0.7	--	--	--

* 8 years (1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006)

[*] See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr

Walleye

Management objective: To maintain a walleye population with a gill-net CPUE of at least 15, 25 cm (10 in) or longer fish in three out of five lake surveys.

The walleye population in Lake Campbell is currently meeting the management objective (Table 3). The lengths of the walleyes sampled suggest that they were produced by the fingerling stocking in 2004 (post winterkill) and the fry stocking in 2006 (Figure 1).

Table 3. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1998-2008.

	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008
CPUE	18.0	5.5		12.0		0.0		20.0		15.0
PSD	93	90		0		--		93		47
RSD-P	7	70		0		--		0		7
Mean Wr	92	92		100		--		102		99

Yellow Perch

Management objective: To maintain a yellow perch population with a gill-net CPUE of at least 25, 13 cm (5 in) or longer fish in three out of five lake surveys.

Only sixteen yellow perch were sampled in the gill nets in 2006 (Table 5). The high gill net catches in 1998 and 2000 can be correlated with adult perch stockings in 1997 and 1999 (Table 8). The 2002 decline in gill net catch was caused by a significant winterkill in 2001 and, in the absence of significant stockings since, the population has not recovered.

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1998-2008.

	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008
CPUE	91.3	151.5		19.0		1.5		0.5		5.3
PSD	10	22		72		--		--		56
RSD-P	0	0		32		--		--		44
Mean Wr	115	92		104		--		--		106

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of less than 100.

Black bullhead trap-net CPUE has declined significantly since 2006 (Table 6) and the size structure of the population has improved with an average length of 210 mm (8.3 in) long (Figure 2).

Table 6. Black bullhead gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1998-2008.

	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008
CPUE	170.6	72.2		2,174.7		1,359.5		1,162.7		153.4
PSD	--	77		6		27		0		39
RSD-P	--	0		0		3		0		0
Mean Wr	--	92		99		95		102		101

All Species

Bluegill, white crappie, black crappie and white bass have all disappeared from Lake Campbell in the last 10 years. This could be further evidence of declining water quality in the lake.

Table 7. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Campbell, Brookings County, 1998-2008.

Species	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008
EMS (GN)	8.0	--		--		--		1.5		0.7
EMS (TN)	--	--		--		--		--		--
COS (GN)	--	--		--		--		--		1.0
COS (TN)	--	--		--		--		--		--
COC (GN)	11.0	0.5		14.7		3.5		6.5		16.3
COC (TN)	5.6	3.9		3.8		3.0		6.9		17.1
WHS (GN)	14.3	16.5		12.0		4.0		11.0		16.3
WHS (TN)	2.2	5.0		0.4		3.0		0.6		4.1
BIB (GN)	5.3	--		31.3		--		--		--
BIB (TN)	13.2	9.0		3.3		5.5		12.0		3.0
SHR (GN)	1.3	--		0.3		--		1.0		--
SHR (TN)	4.5	7.2		0.3		--		--		--
BLB (GN)	54.7	53.5		89.3		26.0		11.0		36.3
BLB (TN)	170.6	72.2		2,174.7		1,359.5		1,162.7		153.4
YEB (GN)	--	--		--		--		--		0.3
YEB (TN)	--	2.4		--		--		4.0		1.3
CCF (GN)	--	0.5		--		--		--		--
CCF (TN)	1.4	--		1.0		--		0.4		0.2
STC (GN)	--	--		--		--		--		--
STC (TN)	--	--		--		--		0.1		--
NOP (GN)	0.3	1.5		7.3		2.0		0.5		2.0
NOP (TN)	1.6	1.3		7.9		5.1		0.9		2.7
WHB (GN)	--	4.5		1.0		--		--		--
WHB (TN)	1.8	7.9		1.7		--		--		--
GSF (GN)	--	--		--		--		--		--
GSF (TN)	--	--		--		--		0.4		0.4
OSF (GN)	--	--		--		--		--		--
OSF (TN)	--	--		--		--		0.1		25.6
BLG (GN)	--	--		--		--		--		--
BLG (TN)	--	0.2		0.1		--		--		--
WHC (GN)	1.7	1.5		--		--		--		--
WHC (TN)	1.3	6.4		--		--		--		--
BLC (GN)	--	2.0		--		--		--		--
BLC (TN)	2.0	5.4		0.3		--		--		--
YEP (GN)	91.3	151.5		19.0		1.5		0.5		5.3
YEP (TN)	8.0	3.3		0.5		--		--		1.8
WAE (GN)	18.0	5.5		12.0		--		20.0		15.0
WAE (TN)	2.1	2.3		1.9		--		4.7		0.9

EMS (Emerald Shiner), COS (Common Shiner), COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), SHR (Shorthead Redhorse), BLB (Black Bullhead), YEB (Yellow Bullhead), CCF (Channel Catfish), STC (Stonecat), NOP (Northern Pike), WHB (White Bass), GSF (Green Sunfish), OSF (Orange-Spotted Sunfish), BLG (Bluegill), WHC (White Crappie), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye),

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings as needed to accomplish the management objective.

2. Consider stocking northern pike as an alternative to walleye stocking. Northern pike are more resistant to winterkill and may provide a more consistent fishery.

3. Reduce nuisance fish populations through a combination of commercial fishing, predator management, and Department removal operations. The construction of an effective fish barrier at the outlet would reduce re-contamination from the Big Sioux River. Reduced nuisance fish populations will help improve water quality, promote the spread of aquatic vegetation, and decrease competition with desirable fish species.

4. Draft a habitat improvement plan that includes nuisance fish control, watershed management, Christmas tree reefs, shoreline riprap, and fishing piers that protect shoreline areas from wind erosion.

Table 8. Stocking record for Lake Campbell, Brookings County, 1986-2008.

Year	Number	Species	Size
1986	500,000	Northern Pike	Fry
1988	31	Bluegill	Adult
1989	500,000	Northern Pike	Fry
1990	670	Northern Pike	Adult
1991	24,600	Northern Pike	Fingerling
1992	30,000	Northern Pike	Fingerling
	1,000,000	Walleye	Fry
	30,000	Walleye	Sml. Fingerling
	50,150	Yellow Perch	Fingerling
1993	75,000	Walleye	Sml. Fingerling
1994	80,000	Fathead Minnow	Adult
	12,488	Yellow Perch	Lrg. Fingerling
1995	50,000	Channel Catfish	Fingerling
1996	52,920	Channel Catfish	Fingerling
1997	202,300	Walleye	Fingerling
	2,560	Yellow Perch	Adult
1999	100,000	Walleye	Fingerling
	11,131	Yellow Perch	Adult
2001	4,620	Yellow Perch	Juvenile
2004	102,100	Walleye	Fingerling
	21,060	Yellow Perch	Fingerling
2006	926,316	Walleye	Fry

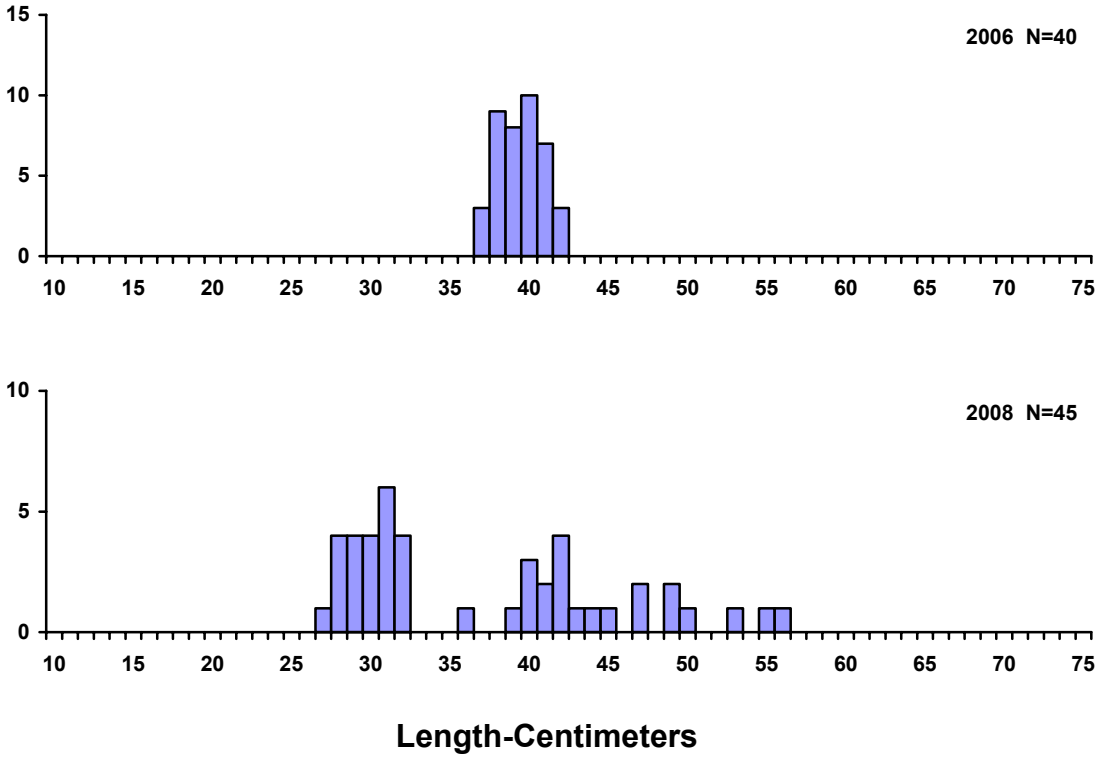

Figure 1. Length-frequency histograms for walleye sampled with gill nets in Lake Campbell, Brookings County, 2006 and 2008.

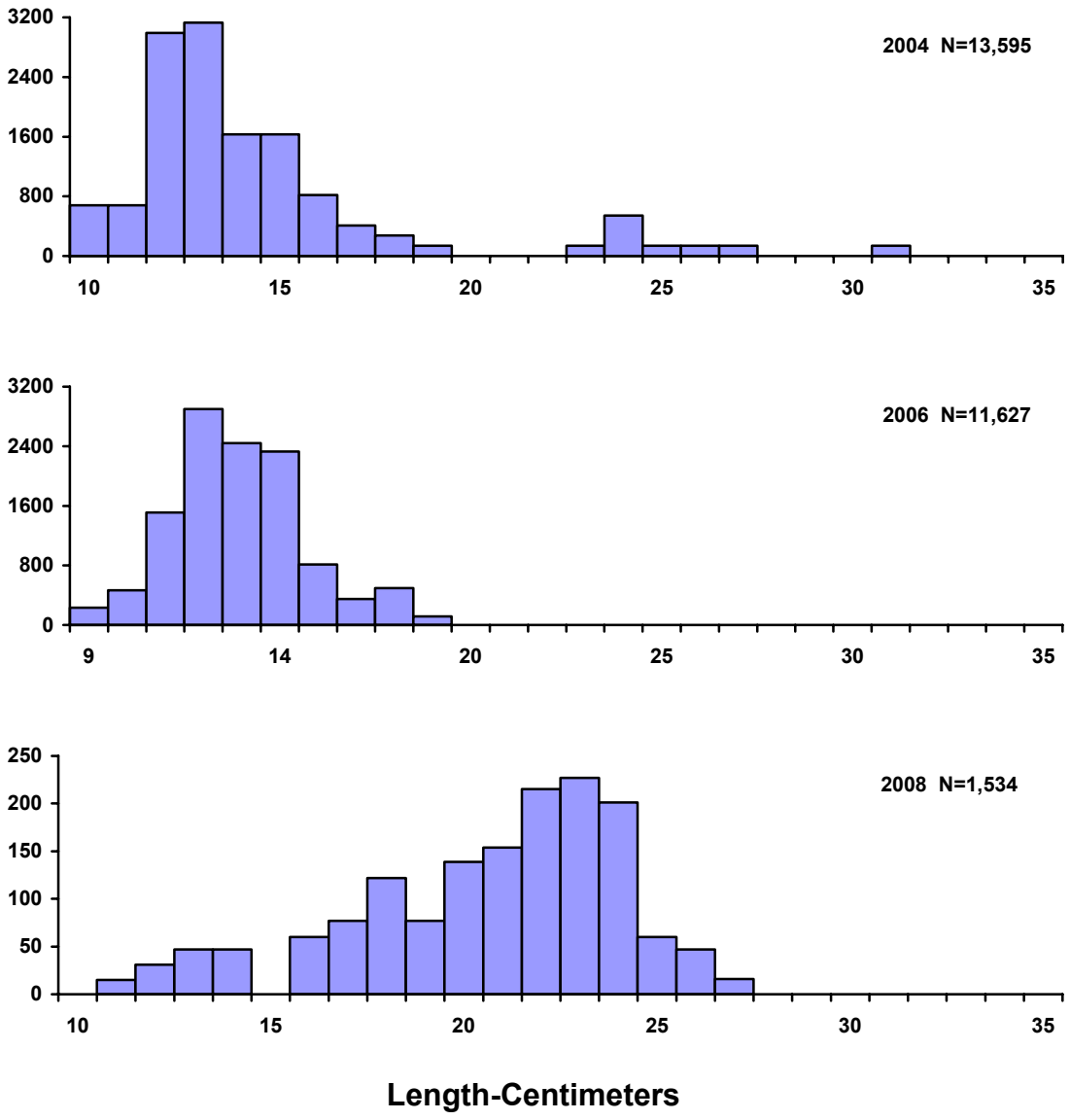

Figure 2. Length-frequency histograms for black bullhead sampled with trap-nets in Lake Campbell, Brookings County, 2004, 2006 and 2008.

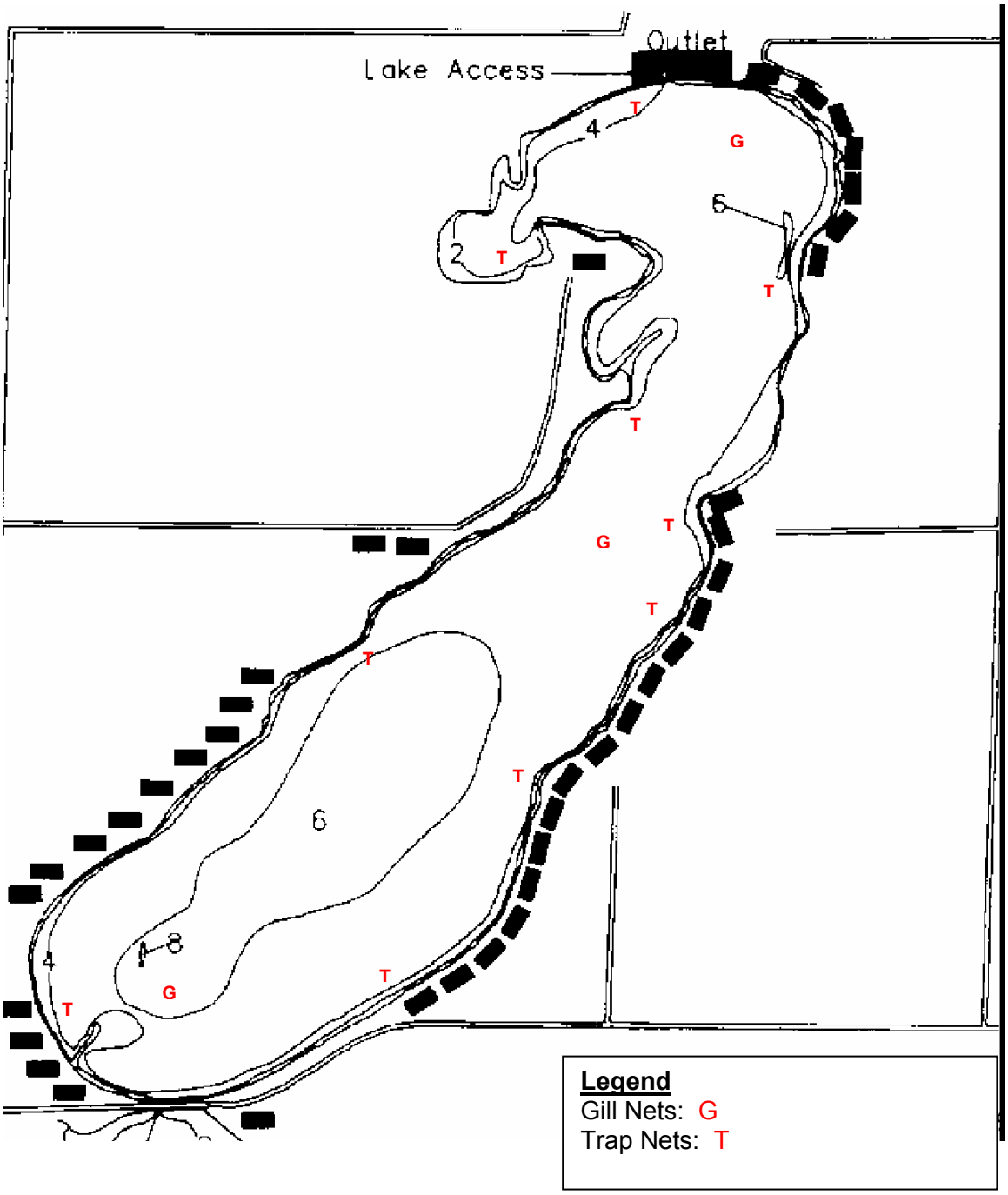

Figure 3. Sampling locations on Lake Campbell, Brookings County, 2008.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.